

This listing of claims will replace all prior versions,
and listings, of claims in the application:

1 Claim 1 (previously presented): A communication device for
2 use in a communication's system that uses multiple tones
3 distributed over a predetermined bandwidth to communicate
4 data, the device comprising:

5 a mapping circuit that receives data symbols and
6 maps the symbols to prescribed time instants in a
7 predetermined time interval to generate a discrete signal
8 including mapped symbols, each mapped symbol corresponding
9 to a discrete point in time; and

10 an interpolation circuit that receives the
11 discrete signal and generates a continuous signal by
12 applying an interpolation function to the discrete signal,
13 the interpolation function operating on the discrete signal
14 such that a frequency response of the continuous signal
15 includes sinusoids having non-zero values at a first set of
16 tones, the first set of tones being a subset of said
17 multiple tones, the non-zero value at each of said first
18 set of tones being a function of a plurality of mapped
19 symbols corresponding to different discrete points in time,
20 the frequency response of the continuous signal also
21 including zero values at a second set of tones, the second
22 set of tones being different from said first set of tones
23 and being another subset of said multiple tones.

1 Claim 2 (previously presented): The device of claim 1
2 wherein the discrete time instants are defined within the
3 range of 0, T/N, 2T/N, ..., T(N-1)/N, where N is a total
4 number of time instants in the predetermined time interval.

1 Claim 3 (currently amended): The device of claim 1 wherein
2 the frequency tones within the ~~allocated tone~~ first set of
3 tones are contiguous frequency tones, and the prescribed
4 time instants are equally spaced and uniformly distributed
5 over one symbol duration.

1 Claim 4 (currently amended): The device of claim 1 wherein
2 the frequency tones within the ~~allocated tone~~ first set of
3 tones are equally spaced frequency tones, and the
4 prescribed time instants are equally spaced and uniformly
5 distributed over a fraction of one symbol duration.

1 Claim 5 (currently amended): The device of claim 4 wherein
2 a fraction of one symbol duration is defined by $1/L$ where L
3 is the spacing between two adjacent ~~allocated frequency~~
4 tones in the ~~allocated~~ first tone set of tones.

1 Claim 6 (previously presented): The device of claim 1
2 wherein a total number of discrete time instants is greater
3 than or equal to a total number of frequency tones
4 distributed over the predetermined bandwidth.

1 Claim 7 (previously presented): The device of claim 1
2 wherein the interpolation circuit further includes a memory
3 for storing the predetermined interpolation functions, and
4 an interpolation function module for retrieving the
5 interpolation functions from the memory and applying the
6 interpolation functions to the discrete signal to generate
7 the continuous signal.

1 Claim 8 (previously presented): The device of claim 7
2 wherein the interpolation functions comprise a matrix of
3 precomputed sinusoidal waveforms.

1 Claim 9 (previously presented): The device of claim 7
2 wherein the interpolation functions comprise continuous
3 interpolation functions.

1 Claim 10 (previously presented): The device of claim 1
2 wherein the mapping circuit replicates the discrete signal
3 of mapped symbols to generate an infinite series of mapped
4 symbols over prescribed time instants covering a time
5 interval from $-\infty$ to $+\infty$.

1 Claim 11 (previously presented): The device of claim 10
2 wherein the interpolation functions comprise sinc
3 interpolation functions, and the interpolation circuit
4 applies the sinc interpolation functions to the infinite
5 series of mapped symbols.

1 Claim 12 (previously presented): The device of claim 1
2 wherein the data symbols are complex symbols associated
3 with a symbol constellation.

1 Claim 13 (previously presented): The device of claim 1
2 further including a digital signal processor for
3 implementing the mapping circuit and the interpolation
4 circuit.

1 Claim 14 (currently amended): The device of claim 1
2 wherein said interpolation circuit includes a sampling
3 circuit for sampling the continuous signal to produce a
4 digital signal sample vector, the device further including
5 a cyclic prefix circuit for receiving the digital signal
6 sample vector from the sampling circuit and prepending a
7 cyclic prefix to the digital signal sample vector.

1 Claim 15 (previously presented): The device of claim 14
2 wherein the cyclic prefix circuit operates to copy an end
3 portion of the digital signal sample vector and prepend the
4 end portion to a beginning portion of the digital signal
5 sample vector.

1 Claim 16 (currently amended): The device of claim 1,
2 wherein said interpolation circuit includes a sampling
3 circuit for sampling the continuous signal to produce a
4 digital signal sample vector, the device further including
5 a digital to analog converter operable to receive the
6 digital signal sample vector and generate an analog signal
7 for transmission ~~within the communication system~~.

1 Claim 17 (original): A communication system for generating
2 an OFDM signal having allocated frequency tones distributed
3 over a predetermined bandwidth, the communication system
4 comprising:

5 a mapping module that receives data symbols from
6 a symbol constellation and maps the symbols to prescribed
7 time instants in a time domain symbol duration to generate
8 a discrete signal of mapped symbols; and

9 an interpolation module that receives the
10 discrete signal and generates a continuous signal by
11 applying an interpolation function to the discrete signal;
12 wherein the interpolation function operates on
13 the discrete signal such that a frequency response of the
14 continuous signal includes sinusoids having non-zero values
15 at the allocated frequency tones, and zero values at
16 frequency tones other than the allocated frequency tones.

1 Claim 18 (original): The communication system of claim 17
2 wherein the allocated frequency tones are associated with a
3 designated transmitter within the communication system.

1 Claim 19 (original): The communication system of claim 17
2 wherein the allocated frequency tones are contiguous
3 frequency tones, and the prescribed time instants are
4 equally spaced time instants uniformly distributed over one
5 symbol duration.

1 Claim 20 (original): The communication system of claim 17
2 wherein the allocated frequency tones are equally spaced
3 frequency tones, and the prescribed time instants are
4 equally spaced time instants uniformly distributed over a
5 fraction of one symbol duration.

1 Claim 21 (original): The communication system of claim 20
2 wherein a fraction of one symbol duration is defined by $1/L$
3 where L is the spacing between two adjacent allocated
4 frequency tones.

1 Claim 22 (original): The communication system of claim 17
2 wherein the interpolation function operates on the discrete
3 signal such that values of the continuous signal at the
4 prescribed time instants are equal to the mapped symbols.

1 Claim 23 (original): The communication system of claim 17
2 wherein the interpolation module includes a memory for
3 storing the interpolation function, the interpolation
4 module retrieving the interpolation function from the
5 memory and applying the interpolation function to the
6 discrete signal to generate the continuous signal.

1 Claim 24 (original): The communication system of claim 23
2 wherein the interpolation function comprises a sinc
3 interpolation function.

1 Claim 25 (original): A communication system for generating
2 an OFDM signal having allocated frequency tones distributed
3 over a predetermined bandwidth, the communication system
4 comprising:

5 a mapping module that receives data symbols from
6 a symbol constellation and maps the symbols to prescribed
7 time instants in a time domain symbol duration to generate
8 a discrete signal of mapped symbols; and

9 an interpolation module that receives the
10 discrete signal and generates a digital signal sample
11 vector by applying an interpolation function to the
12 discrete signal;

13 wherein the interpolation function operates on
14 the discrete signal such that a frequency response of the
15 digital signal sample vector includes sinusoids having non-
16 zero values at the allocated frequency tones, and zero
17 values at frequency tones other than the allocated
18 frequency tones.

1 Claim 26 (original): The communication system of claim 25
2 wherein the interpolation module further includes a memory
3 for storing the interpolation function, the interpolation
4 module retrieving the interpolation function from the
5 memory and applying the interpolation function to the
6 discrete signal to generate a digital signal sample vector.

1 Claim 27 (original): The communication system of claim 26
2 wherein the interpolation function is a discrete

3 interpolation function comprising a matrix of precomputed
4 sinusoidal waveforms.

1 Claim 28 (original): The communication system of claim 27
2 wherein the interpolation module multiplies the matrix of
3 precomputed sinusoidal waveforms with the discrete signal
4 of mapped symbols over the time domain symbol duration to
5 generate the digital signal sample vector.

1 Claim 29 (original): A communication system for generating
2 an OFDM signal having allocated frequency tones distributed
3 over a predetermined bandwidth, the communication system
4 comprising:

5 a mapping module that receives data symbols from
6 a symbol constellation and maps the symbols to prescribed
7 time instants in a time domain symbol duration to generate
8 a discrete signal of mapped symbols; and

9 an interpolation module that receives the
10 discrete signal and generates a continuous signal by
11 applying an interpolation function to the discrete signal;
12 wherein the interpolation function operates on
13 the discrete signal such that values of the continuous
14 signal at the prescribed time instants are equal to the
15 mapped symbols.

1 Claim 30 (original): A communication system comprising:
2 a mapping circuit that receives data symbols and
3 maps the symbols to prescribed time instants in a time
4 domain symbol duration to generate a discrete signal of
5 mapped symbols; and

6 an interpolation circuit that receives the
7 discrete signal and generates a continuous signal by
8 applying an interpolation function that operates on the

9 discrete signal such that a frequency response of the
10 continuous signal includes sinusoids having non-zero values
11 at a first set of tones, and zero values at a second set of
12 tones.

1 Claim 31 (currently amended): The communication system of
2 claim ~~± 30~~ wherein the continuous signal comprises an OFDM
3 communication signal and wherein the value of the
4 continuous signal at each of the prescribed time instants
5 is a function of the mapped symbol at said prescribed time
6 instant.

1 Claim 32 (original): The communication system of claim 30
2 wherein the first set of tones are allocated to one
3 communication device within the communication system.

1 Claim 33 (original): The communication system of claim 32
2 wherein the communication device comprises a transmitter.

1 Claim 34 (original): The communication system of claim 30
2 wherein the interpolation circuit is adapted to store the
3 interpolation function.

1 Claim 35 (original): The communication system of claim 34
2 wherein the interpolation function is a sinc interpolation
3 function.

1 Claim 36 (original): The communication system of claim 34
2 wherein the interpolation function is a matrix of
3 precomputed sinusoidal waveforms.

1 Claim 37 (original): The communication system of claim 36
2 wherein the interpolation circuit multiplies the matrix of

3 precomputed sinusoidal waveforms with the discrete signal
4 of mapped symbols over the time domain symbol duration to
5 generate the continuous signal.

1 Claim 38 (original): The communication system of claim 30
2 further comprising a sampling circuit that samples the
3 continuous signal at discrete time instants distributed
4 over the time domain symbol duration to generate a digital
5 signal sample vector.

1 Claim 39 (original): The communication system of claim 38
2 wherein the discrete time instants are defined within the
3 range of 0, T/N, 2T/N, ..., T(N-1)/N, where N is a total
4 number of time instants in the time domain symbol duration.

1 Claim 40 (original): The communication system of claim 30
2 wherein the data symbols are complex symbols associated
3 with a symbol constellation.

1 Claim 41 (original): A communication system comprising:
2 a mapping circuit that receives data symbols and
3 maps the symbols to prescribed time instants in a time
4 domain symbol duration to generate a discrete signal of
5 mapped symbols; and
6 an interpolation circuit that receives the
7 discrete signal and generates a digital signal sample
8 vector by applying an interpolation function that operates
9 on the discrete signal such that a frequency response of
10 the digital signal sample vector includes sinusoids having
11 non-zero values at a first set of tones, and zero values at
12 a second set of tones.

1 Claim 42 (original): The communication system of claim 41
2 wherein the interpolation circuit is adapted to store the
3 interpolation function.

1 Claim 43 (original): The communication system of claim 42
2 wherein the interpolation function is a matrix of
3 precomputed sinusoidal waveforms.

1 Claim 44 (original): The communication system of claim 43
2 wherein the interpolation circuit multiplies the matrix of
3 precomputed sinusoidal waveforms with the discrete signal
4 of mapped symbols over the time domain symbol duration to
5 generate the digital signal sample vector.

Claims 45-49 (canceled)

1 Claim 50 (original): A method for reducing a peak-to-
2 average ratio in an OFDM communication signal transmitted
3 by a communication device, the method comprising:
4 providing a time domain symbol duration having
5 equally spaced time instants;
6 allocating a predetermined number of frequency
7 tones to the communication device;
8 receiving as input data symbols to be transmitted
9 by the OFDM communication signal;
10 mapping the data symbols to the equally spaced
11 time instants in the symbol duration to generate a discrete
12 signal of mapped symbols;
13 generating a continuous signal by applying an
14 interpolation function to the discrete signal, the
15 interpolation function operating on the discrete signal
16 such that a frequency response of the continuous signal
17 includes sinusoids having non-zero values at the allocated

18 frequency tones, and zero values at frequency tones other
19 than the allocated frequency tones; and
20 sampling the continuous signal at discrete time
21 instants distributed over the time domain symbol duration,
22 to generate a digital signal sample vector.

1 Claim 51 (original): The method of claim 50 wherein the
2 discrete time instants are defined within the range of 0,
3 $T/N, 2T/N, \dots, T(N-1)/N$, where N is a total number of time
4 instants in the symbol duration.

1 Claim 52 (original): The method of claim 50 wherein the
2 step of allocating a predetermined number of frequency
3 tones to the communication device further comprises
4 allocating contiguous frequency tones to the communication
5 device.

1 Claim 53 (original): The method of claim 50 wherein the
2 step of allocating a predetermined number of frequency
3 tones to the communication device further comprises
4 allocating equally spaced frequency tones to the
5 communication device.

1 Claim 54 (original): The method of claim 50 further
2 including the step of replicating the mapped symbols within
3 the symbol duration to generate an infinite series of data
4 symbols over equally spaced time instants covering a time
5 interval from $-\infty$ to $+\infty$ after the step of mapping the data
6 symbols.

1 Claim 55 (original): The method of claim 54 wherein the
2 step of generating the continuous signal further comprises

3 applying a sinc interpolation function to the infinite
4 series of data symbols.

1 Claim 56 (original): The method of claim 50 wherein the
2 discrete signal of mapped symbols includes odd numbered
3 symbols and even number symbols, and further comprises the
4 step of phase rotating each even numbered symbol by $\pi/4$.

1 Claim 57 (original): The method of claim 50 further
2 comprising the step of mapping the data symbols to a block
3 of complex data symbols wherein the block of complex data
4 symbols includes odd numbered symbols and even numbered
5 symbols;

6 phase rotating each even numbered symbol by $\pi/4$;
7 and

8 mapping the block of complex data symbols to
9 equally spaced time instants in the symbol duration to
10 generate the discrete signal of mapped symbols.

1 Claim 58 (original): The method of claim 50 further
2 comprising the step of offsetting imaginary components of
3 the digital signal sample vector by a predetermined number
4 of samples for producing a cyclic offset in the digital
5 signal sample vector.

1 Claim 59 (original): The method of claim 58 further
2 comprising the step of fixing a position of real components
3 of the digital signal sample vector with respect to the
4 imaginary components.

1 Claim 60 (original): The method of claim 58 wherein the
2 predetermined number of samples is an integer number of
3 samples.

1 Claim 61 (original): The method of claim 58 wherein the
2 predetermined number of samples is a fraction of one sample
3 period.

1 Claim 62 (original): The method of claim 50 further
2 comprising the step of prepending a cyclic prefix to the
3 digital signal sample vector.

1 Claim 63 (original): The method of claim 62 wherein the
2 step of prepending a cyclic prefix further comprises
3 copying an end portion of the digital signal sample vector
4 and prepending the end portion to a beginning portion of
5 the digital signal sample vector.

1 Claim 64 (original): The method of claim 50 wherein the
2 step of allocating a predetermined number of frequency
3 tones includes allocating more tones than a total number of
4 data symbols to be transmitted in the symbol duration.

1 Claim 65 (original): The method of claim 50 wherein the
2 interpolation function is a raised cosine function.

1 Claim 66 (original): The method of claim 50 further
2 comprising the step of precomputing the interpolation
3 function and storing the interpolation function in a
4 memory.

1 Claim 67 (original): A method for reducing a peak-to-
2 average ratio in an OFDM communication signal having a set
3 of tones distributed over a predetermined bandwidth, the
4 method comprising:
5 defining a symbol duration for the OFDM
6 communication signal;

7 defining time instants in the symbol duration;
8 allocating frequency tones from the set of tones
9 to a particular communication device;
10 receiving as input data symbols from a symbol
11 constellation, the data symbols being transmitted by the
12 OFDM communication signal;
13 mapping the data symbols to the time instants to
14 generate a discrete signal in the time domain;
15 generating a digital signal sample vector by
16 applying interpolation functions to the discrete signal
17 such that a frequency response of the digital signal sample
18 vector includes sinusoids having non-zero values at
19 allocated frequency tones, and zero values at frequency
20 tones other than the allocated frequency tones.

1 Claim 68 (original): The method of claim 67 wherein the
2 step of allocating frequency tones further includes
3 allocating contiguous tones, and mapping the data symbols
4 to equally spaced time instants distributed over one symbol
5 duration.

1 Claim 69 (original): The method of claim 67 wherein the
2 step of allocating frequency tones further includes
3 allocating equally spaced tones, and mapping the data
4 symbols to equally spaced time instants distributed over a
5 portion of one symbol duration.

1 Claim 70 (original): The method of claim 67 wherein the
2 data symbols are complex symbols.

1 Claim 71 (original): The method of claim 67 wherein the
2 discrete signal includes odd numbered symbols and even

3 number symbols, and further comprises the step of phase
4 rotating each even numbered symbol by $\pi/4$.

1 Claim 72 (original): The method of claim 67 further
2 comprising the step of mapping the data symbols to a block
3 of complex data symbols wherein the block of complex data
4 symbols includes odd numbered symbols and even numbered
5 symbols;

6 phase rotating each even numbered symbol by $\pi/4$;
7 and

8 mapping the block of complex data symbols to
9 equally spaced time instants in the symbol duration to
10 generate the discrete signal.

1 Claim 73 (original): The method of claim 67 further
2 comprising the step of offsetting imaginary components of
3 the digital signal sample vector by a predetermined number
4 of samples for producing a cyclic offset in the digital
5 signal sample vector.